UNITeS Network Services

ViIP Migration Plan
White Paper (draft)

NASA Integrated Services Network

**Unified NASA Information Technology Services
(UNITeS) Contract**

For

George C. Marshall Space Flight Center

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EXECUTIVE SUMMARY

This paper recognizes the current trend in videoconferencing technologies that is leading industry, as well as National Aeronautics and Space Administration (NASA) partners, to migrate from current Videoconferencing over Integrated Services Digital Network (ISDN) services to Videoconferencing over Internet Protocol (ViIP) services. Industry has discovered that using existing wide area network (WAN) infrastructures to support videoconferencing reduces cost and increases efficiency and effectiveness of the service. Because manufacturers of videoconferencing hardware are also following this same technology shift, research and development (R&D) dollars are being shifted to ViIP solutions. It is anticipated that the shifting of technology will also result in long-term incompatibilities between ViIP and ISDN as ViIP features continue to mature.

With the implementation of the migration plan discussed in this white paper, NASA can reduce network costs and increase effectiveness for videoconferencing while mitigating future incompatibilities with ISDN end-point hardware. As addressed in this paper, the overall risk and implementation costs for migrating to ViIP are anticipated to be low and the engineering architecture supports future growth and cost savings, making this project an attractive investment for the future of videoconferencing within NASA.

For reasons discussed throughout this document, it is recommended that NASA initiate a plan and appropriate funding to migrate from current ISDN technologies to ViIP technologies.

OBJECTIVE

The objective of this paper is to provide an overview on processes involved with migrating the NASA Integrated Services Network (NISN) managed Video Teleconferencing Services (ViTS) from ISDN to internet protocol (IP) utilizing the NISN WAN and the current video bridging services.

As a whole, this paper lays the groundwork for NISN to expand in-house bridging services to include all of NASA's video and audio bridging requirements in the future. More specifically, this paper discusses the current ViTS service platform and ViIP features, with advantages and disadvantages, followed by ViIP migration process requirements, the design approach, a rough order of magnitude cost analysis, a project baseline schedule, and overall risks.

CURRENT NISN VIDEO TELECONFERENCING SERVICES

Video Teleconferencing Services are provided agency-wide to NASA contractors and partners by the NISN Project, managed out of Marshall Space Flight Center (MSFC). Currently, NISN provides ViTS services to over 390 registered sites around the world. NISN offers private and standard videoconferencing services along with ISDN and limited IP network transport.

ELEMENTS THAT MAKE UP ViTS

The NISN Video Teleconferencing Services include the following elements:
- NISN Private ViTS
- NISN Standard ViTS
- NISN Web-based Scheduling System
- NISN Design of Next Generation ViTS Rooms (not addressed in this white paper)

The NISN Private ViTS

The NISN Private ViTS consists of two private video bridges (also called a multipoint conferencing unit [MCU])—one at MSFC and one at Langley Research Center (LaRC)—that are managed by the Video Teleconferencing Center (VTC) at MSFC. This service supports videoconferences for the NASA Engineering and Safety Center (NESC) and the Center Director's videoconferencing network.

Although the NISN Private ViTS utilizes the NISN Wide Area Network for H.323 video transport, both video bridges have dedicated ISDN connectivity as well, allowing them to support IP (H.323) to ISDN (H.320) video calls. The MSFC video bridge will support up to 16 IP sites or 15 ISDN sites @ 384 kbps. The LaRC video bridge will support up to 16 IP sites or 7 ISDN sites at 384 kbps. There are currently more than 130 registered Private ViTS users.

NISN Standard ViTS

NISN Standard ViTS utilizes an outsourced service provider that provides ISDN (H.320) video bridging and VTC Operations for over 250 registered H.320 ISDN users NASA-wide. Currently, the majority of ViTS video calls are transported over an ISDN backbone (fig. 1).
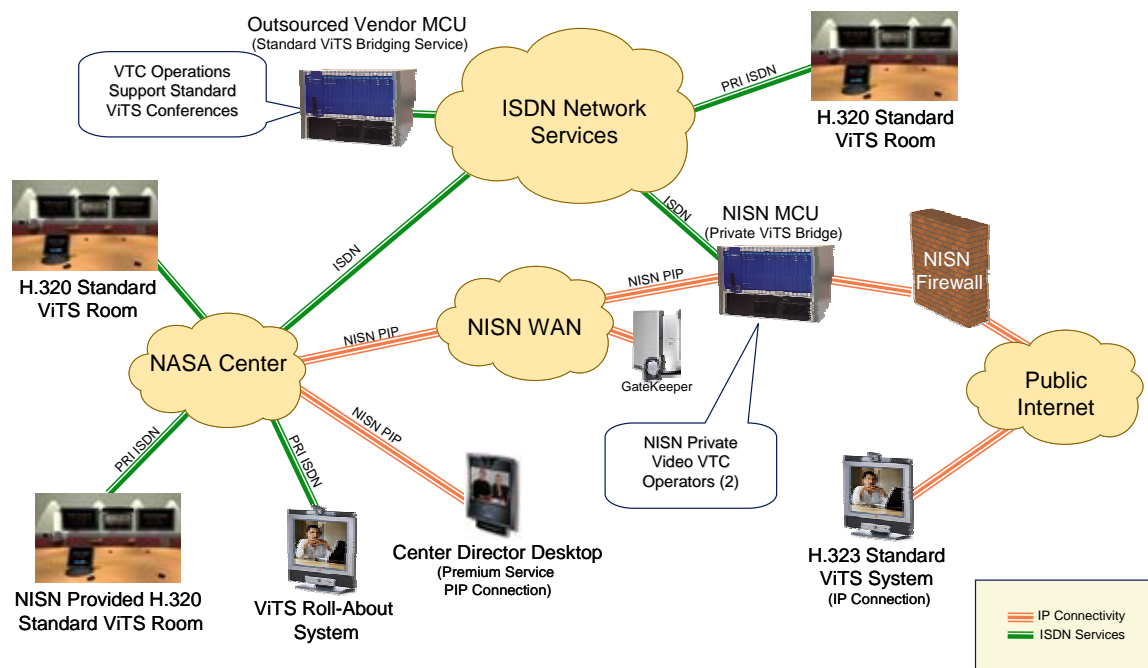
Fig. 1
Current ViTS Network Diagram

NISN Web-Based Scheduling System

The NISN web-based scheduling system provides ViTS coordinators with access to daily schedules of more than 250 ViTS rooms agency-wide. The scheduling system was first created in the 1980's to manage less than 20 NISN provided ViTS rooms. Over the years the scheduling system has evolved into a powerful web-based tool capable of identifying scheduling conflicts and providing alternative ViTS room resources at each site. The production scheduling system was last updated in 2002 by NISN software engineers and is well-accepted by users across the agency. Updates are first developed by NISN and tested on a developmental server at MSFC, and then released for production.

NISN is exploring new enhancement ideas for the scheduling system such as supporting an interface into Microsoft Outlook and preloading conference schedules into the video bridge. This research is being conducted under the NASA Collaboration Infrastructure (NCI) Study and is laying the groundwork for future technologies and costs savings associated with videoconferencing services.

CURRENT NISN ViTS NETWORK UTILIZATION AND COST

NISN ViTS Utilization studies show that NASA spends an average of 7 million minutes a year, over $1.3 million, in NISN supported videoconferences. That number translates to approximately 112,000 annual hours of videoconferencing, or more than 50 ViTS rooms being in a videoconference 8 hours a day for every working day in the year. Approximately 85% of all the video minutes are made up

of point-to-point calls that typically cost approximately $.12 per minute, while the remaining 15% are multipoint calls placed through the video MCUs (fig. 2).

Multipoint Minutes , 1080000, 15%

Point-to-Point Minutes , 6120000, 85%
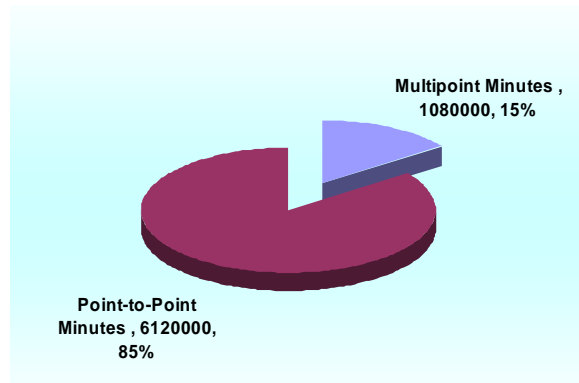
Fig. 2
Minutes Utilization Summary

Both the Private ViTS and the Standard ViTS Services utilize MCU technology to support multipoint calls. The Private ViTS MCUs, with over 130 registered sites, utilize an average of 4.5 ports with a peak port usage of 19 ports out of 24 available ports. The Standard ViTS MCUs, with over 250 registered sites, utilize an average of 140 ports at any given point in time with a peak port usage of 165 ports out of a virtually unlimited amount of available ports (fig. 3).

Utilization Category	Private ViTS Services	Standard ViTS Services
Registered ViTS Sites	132	254
Peak MCU Port Utilization	19	165
Average MCU Port Utilization	4.5	140

Fig. 2
MCU Utilization Summary

Because NASA owns the Private ViTS MCUs and maintains the hardware through a service contract, there are no multipoint port charges [need to factor in any labor support, hw and maintenance costs]for MCU utilization. In contrast,

multipoint video calls placed through the Standard ViTS video bridging services costs an average of $1.05 per minute for a 384kbp video call, which equals an annual cost of slightly over $1 million dollars.

WHY MIGRATE TO VIIP?

OVERVIEW ON INDUSTRY DIRECTION

There is a growing demand for Video over IP (ViIP) within NASA. The videoconferencing industry is migrating from ISDN standards (H.320) to IP-based videoconferencing (H.323) to reduce costs by consolidating networks and increasing system compatibility and interoperability, and to utilize effective collaboration through the use of IP-based collaboration tools.
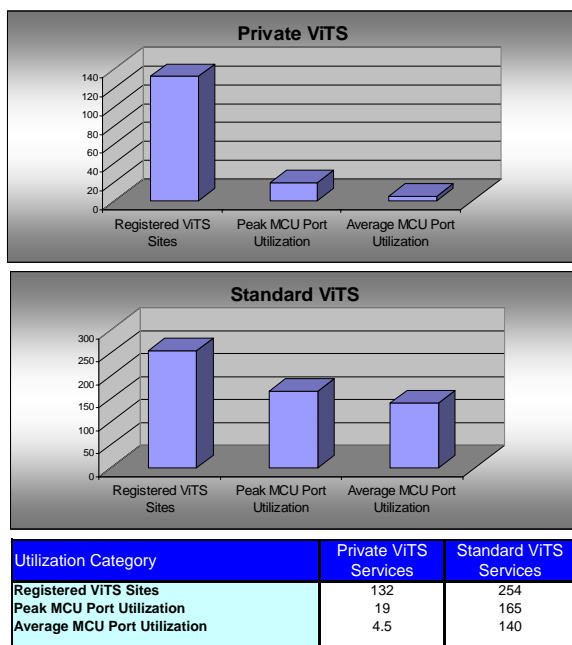
Reducing Costs by Consolidating Networks

Many organizations have been able to reduce costs by consolidating networks and moving their videoconferencing traffic to their existing WAN services. This allows organizations to drop or reduce the number of dedicated ISDN circuits for videoconference services. ISDN users are billed monthly, plus per-minute usage while IP users can often avoid a network bill if they are utilizing available WAN resources. Additionally, the IP users are provided with powerful H.323 "utilization and statistics" reporting tools that can quickly identify any bandwidth utilization issues.

Businesses now can save thousands of dollars by migrating away from dedicated ISDN circuits. Although NASA pays a reduced price for dedicated primary rate interface (PRI) circuits, NASA still spends approximately $250,000 dollars a year in monthly charges for these dedicated circuits, in addition to usage charges.

Increasing System Compatibility and Interoperability

Since H.320 was designed to work over ISDN, its capabilities are limited by the ISDN technology itself and cannot support future system capabilities offered over WAN services. On the other hand, H.323 standards are WAN-friendly, with a few exceptions related to new security policies, and can grow with user demand for a number of years. The coder/decoder (codec) industry realizes this trend and is investing more research in H.323 along with SIP (Session Initiated Protocol) and 3G standards. These protocols are being developed to offer more compatibility with WAN infrastructures and increasing security policies. It is anticipated that by 2012, three ViIP protocols will be recognized as standards within the ViIP WAN services. Those three are H.323, SIP, and 3G, with SIP protocol expected to dominate as the primary standard over WAN ViIP services.

SIP and 3G protocols are not currently capable of supporting many of the H.323 features offered today. However, these protocols, by design, have

potential in increasing videoconferencing compatibility between codecs, desktop computers, videophones, and video-enabled cell phones while maintaining adequate security standards.

Data Collaboration Tools

The videoconferencing industry realizes that effective collaboration not only includes talking heads, but also now includes the discussion of data from laptops or room computers. To accomplish data collaboration between video sites, one must either rely on the video codec to transmit a high resolution computer image to the end-point, or utilize an IP network that would allow users to access the collaboration tools independent of the codec.

More users are realizing the importance and power of IP-based collaboration tools. Some of these tools interact with video codec hardware, while others allow application sharing of desktop software independent to the video codec.

One of the most popular collaboration tools being used today is web server-based and allows multiple users to log in and view or present PowerPoint presentations and other applications at native resolution. With IP presence in the videoconferencing facility, this technology is feasible, and the usage trend is increasing. NASA is experiencing an increased demand from within the agency and from NASA partners to collaborate over IP, using both H.323 collaboration via the codec and data collaboration applications independent of the codec.

SETTING THE STAGE

Although moving to IP sounds like a great way to save money, reducing network transport costs is only a fraction of the overall cost of videoconferencing services within NASA. As discussed earlier, research shows that most of the cost associated with NASA videoconferencing is actually video bridging charges incurred from the outsourced service provider. NASA spends approximately $1 million dollars a year on video bridging charges through their outsourced provider. This number is approximately three times the cost of a good video bridge.

The general migration of NASA ViTS to IP is the first step in laying the groundwork for potentially bringing video and audio bridging services in-house in the future.

ViIP FEATURES, ADVANTAGES, AND DISADVANTAGES

NEW FEATURES OF NISN ViIP

The NISN ViIP services will be capable of supporting new H.323 features as they are developed and released for production. A few major features that are available commercially today include Advanced Encryption Standard (AES) ,

Instant Video and Private ViTS Gateway services, additional media channel or dual video support across the MCU, and global management of end-points.

Advanced Encryption Standard AES Encryption (H.235 version 3)

AES v3 will be supported on all compatible end-point codecs in point-to-point and multipoint video calls running over IP. End-point users must enable encryption on both ends in order to engage AES. The older video codecs found in the legacy ViTS rooms are also capable of supporting H.323 AES encryption with the purchase of a software key.

Instant Video and Private ViTS Gateway Services

Instant Videoconferencing is a bridging service now offered without the need for reservations by the current outsourced provider. Instant Videoconferencing supports up to 384kbps for six participants running any combination of video or audio formats such as IP, ISDN, Voice over IP (VoIP), or plain old telephone service (POTS). Participant sites can be bridged together in one instant video call using a dial-in number and a pass code. Standard video bridging port fees apply and will be charged back to the account holder in the same method as the current Instant-Meeting audio bridging service fees. This service will be offered under NISN Standard ViIP.

In conjunction with this service, the MCU and Path Navigator hardware on the NISN Private ViTS platform can be upgraded to act as an internal gateway between ViIP users and ISDN users. For example, if a ViIP-only site wanted to call a legacy ISDN site, the ViIP site would simply dial 67* plus the ISDN number. The Path Navigator would build a connection between the ViIP site, the MCU, and the ISDN site. To the user, it would appear to be a point-to-point call from ViIP to ISDN. This is a standard Polycom Path-Navigator feature that is commonly used by in the videoconferencing industry. There would be no bridge port fees associated with this feature since it is using the Private ViTS resources.

Additional Media Channel (H.239)

Additional Media Channel (H.239) is a recent International Telecommunications Union-Telecommunication (ITU-T) standard that allows new generation video codecs to transmit and receive a second channel of video over the same video call. The codecs can utilize this second video channel for transmitting a high-resolution graphics channel with computer images or an additional camera view of the room.

Although H.239 features are not exclusive to ViIP services or H.323 codecs, the feature will be supported by the video bridging service provider under ViIP services. However, some older H.320 codecs may not be able to support this capability due to hardware limitations of the codec. For example, the VS4000 series Polycom codec used in NISN full service rooms is capable of receiving

an additional media channel, but would require an expensive hardware upgrade in order to be capable of transmitting an additional media channel.

Additional MCU Support Features

The new MCU technology that will be utilized with ViIP will support AES over IP, H.264, and H.239 standards within multipoint video calls.

Global Management

The performance of end-point hardware running on the NISN WAN can be monitored by the WAN network services and the ViTS services. Often, end-point failures can be identified before they actually impact customers. Software updates and security patches can be applied quickly over the WAN from the VTC.

Future Enhancements

After the implementation of ViIP, each feature described can be fine-tuned to provide improved performance as additional usage data is collected over time. NISN will also be capable of monitoring performance and providing enhancements to end-point hardware via the ViIP network.

ADVANTAGES OF MIGRATING TO VIIP

Cost Savings

The cost savings related to moving ViTS to ViIP are associated with the removal of PRI circuits and accumulated per-minute ISDN charges. The amount saved depends on how many PRI circuits can be removed over time. Each PRI removed will save an average of $175 per month in loop charges. For example, if 120 PRI circuits are removed, NASA could save approximately $250k per year in loop charges. However, these savings will be partly offset by the new data circuits required to support an IP connection to the endpoint, as well as data connections to the outsourced video bridging services. Refer to the cost analysis section of this report for projected costs savings.

Faster Call-Connect Time

A standard 384kbps call over IP is as much as six times faster in connecting to the end-point hardware, giving the user a sense of quality and stability. Call-connect time should not be confused with data rate or picture quality. The picture quality of a 384kbps call over IP running Quality of Service (QoS) is the same as running over ISDN. The key difference is that IP is not channeled into 64kbps channels, as ISDN; therefore, end-points can quickly negotiate call configurations to establish the call.

IP Platform Stability and Manageability

Once an IP site is tested and certified, its reliability exceeds ISDN because it is in a managed network, and any problems with data can usually be corrected automatically through network management. This increases the overall reliability and stability of the service. Problems with networks often can be identified and corrected before the user is even aware of an issue. However, for sites that have not been tested and certified, a considerable amount of technical support may be required to resolve routing issues and firewall rules.

Rapid Deployment of New Systems

A very important advantage of using IP over ISDN is related to the deployment time of circuits. ISDN circuits may take a minimum of one month to install, while IP circuits, depending on the chosen end-point strategies, may be implemented within days. Depending on the chosen end-point strategy, video systems could be relocated in different conference rooms as needed, without reconfiguration of network services.

DISADVANTAGES OF MIGRATING TO ViIP

Firewalls

Security patches to firewalls can be placed at the top of the list of concerns. Since H.323 requires several ports to be available during the call negotiation and setup of a videoconference, simple changes in firewall rules can disable H.323. Often without warning to users, network management operations may be required to install security patches into the network or adjust firewall and network router settings in a way that would impair end-point hardware from properly communicating over IP.

Issues like these are manageable with strict process policies on the NISN WAN. However, when external networks are traversed to reach the end-point hardware, NISN must rely on a strong network and security MOA policy with the external network administrator.

Firewall traversal technology has recently become available and will be considered in the design phase for interfacing to off-net locations in effort to mitigate this type of user impact.

Quality of Service (QoS)

Another disadvantage of migrating to ViIP is related to Quality of Service (QoS) issues seen in interfacing to external networks. Video and audio must maintain low latency and low jitter. Packets that are lost or arrive at the end-point hardware at the wrong time often result in a degraded picture quality. As stated in the ViIP Requirements Document, packet loss should remain less than 1% to maintain acceptable video and audio jitter. This often is not

controllable when connecting to sites via the public Internet. Educating the end-user about these limitations and maintaining network policies are some of the best ways to reduce overall customer dissatisfaction. As time goes by, more networks are being designed to handle QoS. Although the current NISN WAN does not support QoS, it will be supported after the WAN has been upgraded.

Real-Time Troubleshooting

Currently, troubleshooting ISDN largely involves calling the outsourced ISDN provider and waiting for a green light on the carrier service unit (CSU) again. This is not so with IP troubleshooting. For example, if a scheduled video call failed to connect, the NISN network management group and Gateway technicians would be responsible for testing and troubleshooting this issue in real time until it is resolved. A learning curve can be anticipated as VTC Operations, Gateway technicians, and engineers become familiar with common-cause failures.

Connections to ISDN Sites

One last disadvantage worth noting is related to off-net access. All video connections to off-net users, outside of the NISN WAN or certified peering sites, must be made through a video bridge. For example, although NISN ViTS rooms would be on IP, they could not conduct a point-to-point conference with a university end-point on IP without going through the outsourced video bridge or the NISN Private Bridge. As discussed earlier, bridged calls make up approximately 90 percent of the ViTS bill. Although this scenario may or may not significantly increase bridge activity, a slight increase in bridged calls will show up quickly on the MCI bill. One method that can help reduce this possible impact would involve utilizing the NISN Private ViTS Bridge to avoid per-minute charges. Over time, the capacity of the NISN Private Bridge may need to be upgraded to handle any extra traffic. Another alternative method is to leave a PRI service in the room to be used for special cases.

ViIP DESIGN APPROACH SUMMARY

The design approach for migrating NASA ViTS services to ViIP over the NISN WAN is based on common industry-accepted technologies and can be implemented in a phased approach so that it provides little to no impact to NISN ViTS end-users. The basic design approach consists of three major elements:

DESIGN OF CONVERGED VIDEOCONFERENCING NETWORK PLATFORM

A converged videoconferencing network platform has been developed in support of the NISN primary objective to migrate ViTS ISDN services to ViIP services that are transported over the upgraded NISN WAN backbone. The new converged network design has the capability of providing videoconferencing services

reliability to Legacy ISDN ViTS sites, new NISN ViIP sites, and Off-Net ViIP sites (fig. 4). Furthermore, this design continues to support Standard ViTS and Private ViTS platforms to continue to meet user expectations.
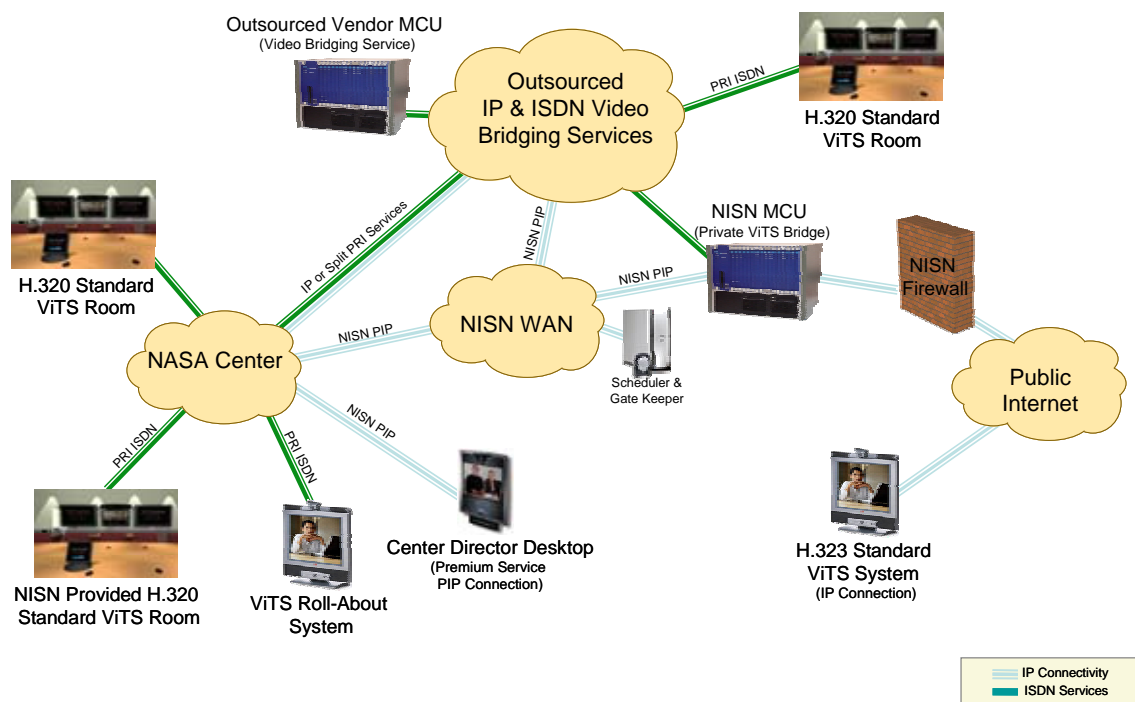

Fig. 4
Converged Videoconferencing Network Platform

DESIGN AND SELECTION OF END-POINT INTERFACE

The proposed design also supports a variety of end-point interface options to meet the demand of various IT and security requirements throughout the NASA community. The following four interface methods were developed and tested (criteria for selecting the appropriate method are discussed later in this document):

- Direct NISN PIP Connection Method
- Best Effort IP Connection Method
- Indirect PIP Connection Method
- Split PRI Connection Method

DESIGN OF VIDEO BRIDGING SERVICE INTERFACE OPTIONS

As part of the NISN requirement, the design of this Videoconferencing Network platform utilizes the same Outsourced Video Bridging Service Provider that is currently used for ISDN bridging services. This provider has recently upgraded their services and capabilities to include ViIP services. For NASA to utilize these ViIP services, NASA must provide a peering interface into the service provider's Private IP network. The proposed NISN design will support two T-3 peering

interface points—Chicago, IL and Ashburn, VA—with the Ashburn bridging site serving as a redundant connection used to support disaster recovery operations.

Based on current video bridge port utilization analysis discussed earlier in this document, the anticipated bandwidth utilization for video bridging provider will be less than 20megs peak. T-3 Network Access cost is discussed later in this paper.

ViIP MIGRATION PROCESS REQUIREMENTS

Although the final draft of the ViIP Services Requirements Document, released in September 2005, established the technical requirements for the development of Standard ViIP Services, this section identifies the necessary processes required to support the migration. Processes include defining the criteria for identifying qualified end-points, defining criteria for proper ViIP interface methods, discussing the functional overview of ViIP Implementation and Operations, and addressing network policy to support proper interfaces to end-point hardware.

CRITERIA FOR IDENTIFYING QUALIFIED END-POINTS

The first requirement that will be addressed in the migration process will be to determine which ViTS sites should be selected for initial migration. Realizing that not all NASA ISDN users will qualify as candidates for migrating to a NISN ViIP service, selection criteria must be developed and utilized to choose those candidates who are technically compliant and would best benefit from the migration.

There are currently over 250 sites registered with NISN Standard ViTS that must be evaluated for ViIP migration. Each ViTS site will be evaluated against technical criteria similar to the sample rules listed below to determine eligibility. The final criteria will be provided in the ViIP Implementation Plan.

1. A ViTS site can be eligible as a ViIP candidate if the site has an IP-ready video codec, has a current NISN "700" number assigned to it, and the site resides on a NASA Center that has adequate NISN Premium IP (PIP) service bandwidth.

2. A ViTS site can be eligible as a ViIP candidate if the site has an IP-ready video codec and the ViTS site resides in a building that has adequate access to NISN PIP services.

3. A ViTS site can be eligible as a ViIP candidate if the site has an IP-ready video codec, there is more than one ViTS site that resides within the same NASA building, and the NASA center in which the building resides has adequate NISN PIP presence that can be extended to the building by fiber.

The approach for determining qualified candidates from the final criteria will involve completing a survey and working with NISN Gateway technicians and customers during development of the ViIP Implementation Plan. An implementation study team involving engineers and CSRs will be developed at this point to ensure ViTS sites are properly evaluated.

NISN conducted a preliminary analysis of the current NISN ViTS Site registration list and identified over 130 sites that may be eligible for ViIP migration. A closer examination will be conducted during the implementation planning. Actual numbers are not expected to vary much from this figure and will be provided with the ViIP implementation plan.

CRITERIA FOR IDENTIFYING PROPER ViIP END-POINT TRANSPORT METHODS

As described in the final draft of the ViIP Requirements Document released in September 2005, the four interface methods have been designed to provide network transport to end-point hardware. The selection of a method will depend on the environment in which the end-point resides. The technical description of each method is discussed in greater detail within the ViIP Requirements Document. However, the figure below depicts a simple diagram of each method (fig. 5).
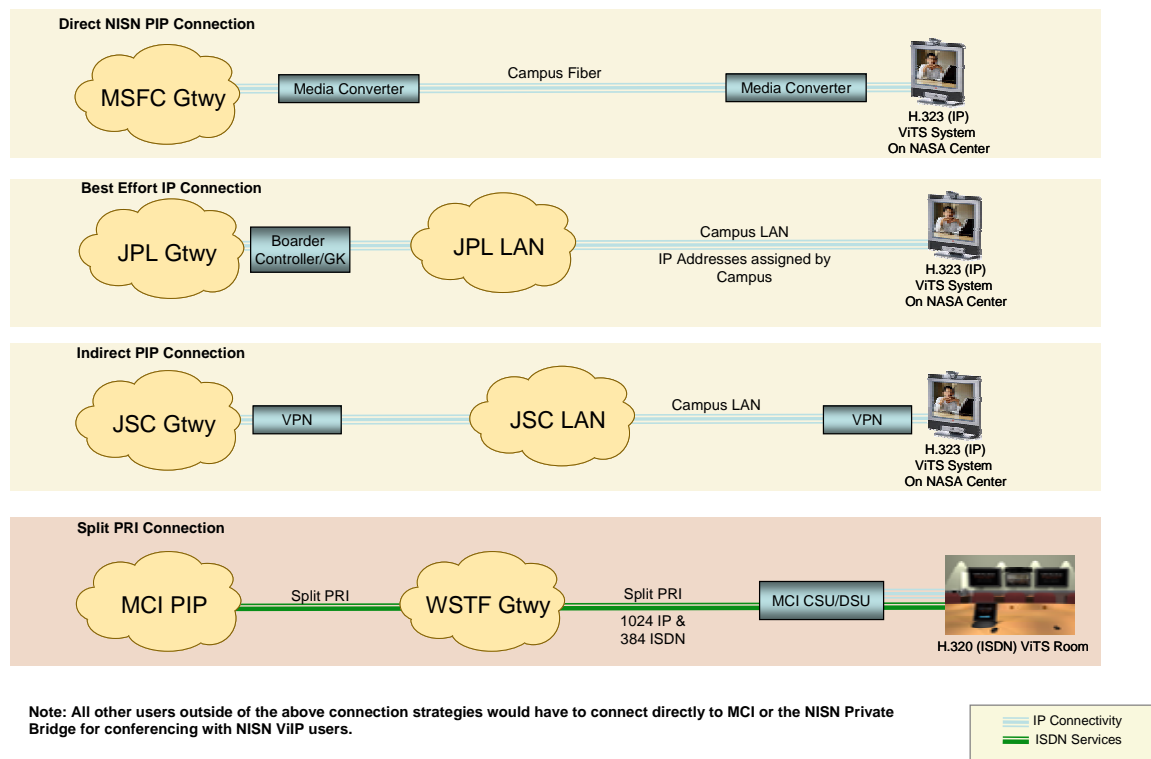

Fig. 5
ViIP End-Point Transport Methods

All NASA site cable plants and infrastructure policies are not equal. Some NASA sites encourage direct PIP connection from NISN over local infrastructure while

others restrict access. NISN has developed four end-point interface methods in effort to mitigate IT policy issues at various sites. By default, NISN will attempt to provide a Direct NISN PIP connection to the end-point device. However, when that is not a viable choice, one of the remaining three methods will be explored. These methods are as follows:

- Dedicated PIP (DPIP)—This transport method will be selected by default in an attempt to provide the best quality and reliability possible for transport of ViIP services to the end-point hardware. This method will be chosen if the customer agrees that NISN can provide PIP service to the end-point and there is already existing infrastructure available for appropriate PIP transport between the NISN Gateway and the end-point.

- Indirect PIP (IDPIP)—This transport method will provide an indirect PIP connection between the NISN Gateway and the ViIP hardware via the use of VPN over the local campus LAN. This method will be chosen if Direct PIP is not allowed across campus infrastructure but the customer agrees that NISN can manage the end-point by traversing the campus LAN.

- Best Effort IP (BEIP)—This transport method will provide an interface from the local NISN PIP border router/controller to end-point on the local campus LAN. This method will be selected if Direct PIP and Indirect PIP are not allowed by the customer. The customer also agrees to accept and abide by the NISN "Best Effort" MOU service policy that provides network and security requirements and states that NISN is not liable for quality of service issues concerning video transport over the customer's LAN infrastructure.

- Split PRI (ISDN & IP over PRI)—This transport method will provide a 1024kbps IP, 90% egress connection directly from the end-point hardware to the vendor video bridging network. It will also provide a 384kbps ISDN circuit for ISDN usage by the end-point. This solution has monthly charges associated with the IP transport, making it the least recommended solution. This method will be chosen if none of the above methods apply and if the customer requires both ISDN and IP capabilities at the end-point.

- If none of these methods are acceptable, the customer will be required to provide independent transport back to the vendor provided NISN video bridging service. NISN would not be liable for any QoS issues that may result in the use of this configuration.

IMPLEMENTATION AND OPERATIONS FUNCTIONAL OVERVIEW

Summary of Implementation Plan

This section provides a summary of initial implementation activities that will oversee a phased approach for migrating NASA ISDN sites to the NISN ViIP services. Because the approach is phased, qualified NASA ISDN sites may be converted to ViIP without the need for a massive cutover approach. Some sites may continue to require dual access (ISDN and ViIP) for a period of

time, even though the NISN ViIP services will provide a reliable method for ViIP sites to reach legacy ISDN rooms that have not converted over to ViIP. As sites are converted to ViIP and become comfortable with the use of ViIP, a circuit disconnect order will be processed at the request of the user to remove this ISDN circuits. This will be encouraged by NISN in effort to meet one of the project objectives for cost savings.

The following activities describe the major implementation milestones that will be applied to the initial ViIP Implementation Plan;

- Identify qualified NASA sites
- Identify interface method for qualified NASA sites
- Provide final list of qualified NASA sites
- Pre-certify selected sites with outsource video bridging services
- Develop ViIP Security Plan
- Procure and install interface hardware
- Secure necessary campus infrastructure for ViIP transport
- Install interface infrastructure hardware
- Test and certify end-point hardware with outsource video bridging provider
- Provide site training

Operations Overview

The day-to-day operations of ViIP basically will remain the same as the current operations but with increased capabilities. Users will continue to schedule conferences through the web-based scheduling system and the outsource video bridging service provider. Billing structure is based on the pricing available today and is discussed in the Costing section of this report.

All standard videoconferencing practices that currently apply to today's ViTS over ISDN services will continue to apply to ViIP services. These practices include the continuation of a 30-minute setup time for all major multipoint videoconferences using outsourced bridging service providers, room system validation and checkout, and standard trouble ticket processing.

Instant Video services will be a new video bridging service offered under the Standard NISN ViIP services. This service does not require reservations. Standard bridge port usage charges apply but are charged back to the institution that owns the Instant Video account used for the meeting. Also, like Instant Meetings accounts, Instant Video accounts are free but must be used once every three months to stay active. The NISN VTC Operations can assist in setting up new accounts for room coordinators upon request. This service along with the Private ViTS gateway service will be used when a ViIP site desires to conduct a Point-to-Point conference with an ISDN site.

Migration Plan White Paper

Backward Compatibility During Transition

Backward compatibility between ViIP sites and ISDN sites will be accomplished through the use of the Instant Video Services or the Private ViTS Gateway services during and in some cases after the transition. All standard videoconferencing features such as AES, and dual video content will be supported through these services at call speeds up to 384kbps.

User Training and Documentation

A user training document will be prepared during the implementation phase to cover all operational issues and concerns related to the migration to ViIP services. This document will be presented to ViTS coordinators in the form of a PowerPoint presentation over a ViTS conference prior to the migration to ViIP services.

Network Policy

NISN will develop Network Policy MOU documentation that will address the off-net interface requirements placed on off-net users. This document will address security requirements, network and firewall configuration requirements, and a NISN "best effort" liability statement. This document must be signed by appropriate authority from NISN and from the off-net network administrators and users before NISN will extend services to the end-point hardware. This document will be developed during the Implementation Planning phase and reviewed by NISN management and NISN security.

RISK ANALYSIS SUMMARY

Many technical risks have been mitigated over time due to the increased stability and maturity of the ViIP H.323 industry standards and the adequate capacity of the NISN WAN to support ViIP. However, there are risks associated with network policy and interfacing to external networks where NISN has no control over QoS. A summary of these risks are as follows:

- The success of ViIP services will rely on establishing solid network access and support policies between NISN WAN and NASA centers across the agency.
- NISN MOA policies must address firewall rules, access lists, QoS, and security controls.
- Without the reinforcement of these policies, the overall connectivity and dependability of the ViIP service will be at risk.

ALTERNATIVE ANALYSIS SUMMARY

The table below indicates two alternatives that were evaluated, the potentials offered, and the reasons why they were discarded.

Alt. #	Alternative Category	Alternative Analysis	Analysis Summary	Service
1	In-house Video & Audio Bridging Services	Include in the ViIP project the initiative to also bring in-house a video and audio bridge and a NASA VTC Operations Center to support in-house conferencing services	• Potentially significant cost savings • Build infrastructure first and then consider moving bridges later	ViTS & VoTS Bridging Services
2	In-house Video & Audio Bridging Services	Include in the ViIP project the initiative to being the video bridge in-house, along with the associated operations of the bridge	• Potentially significant cost savings • Transition to new IP network infrastructure should be developed first	ViTS Bridging Service
3	Steady State	Leave exiting services on ISDN	• Reduction in system compatibility with NASA partners • Turn down potential cost savings and technology advancements	ViTS Standard Services

Fig. 6
Alternative Analysis Summary Table

BASELINE IMPLEMENTATION SCHEDULE

The following 15 month baseline implementation schedule represents the time needed for migrating NISN ViTS to ViIP services (fig. 13). This baseline schedule can be adjusted to start after appropriate funding is set aside for the project.
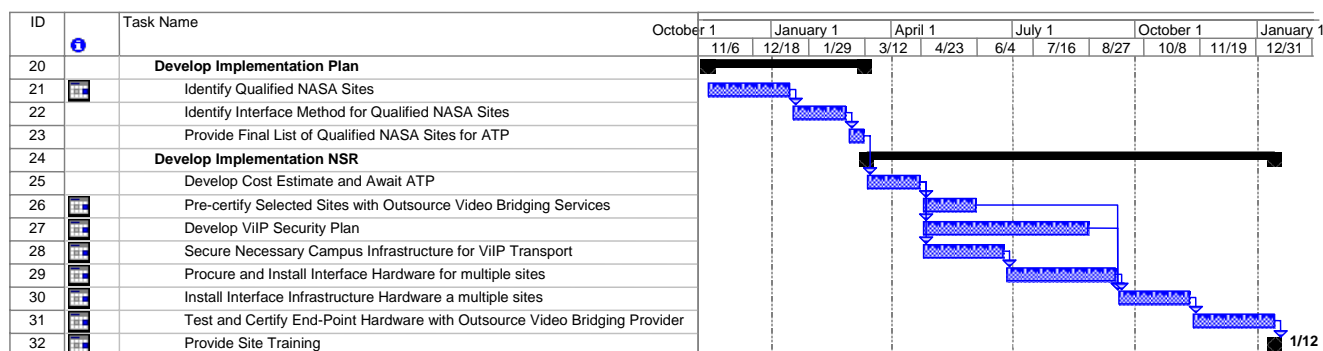
ID		Task Name	October 1	January 1	April 1	July 1	October 1	January 1
			11/6	12/18	1/29	3/12	4/23	6/4	7/16	8/27	10/8	11/19	12/31
20		**Develop Implementation Plan**						
21		Identify Qualified NASA Sites						
22		Identify Interface Method for Qualified NASA Sites						
23		Provide Final List of Qualified NASA Sites for ATP						
24		**Develop Implementation NSR**						
25		Develop Cost Estimate and Await ATP						
26		Pre-certify Selected Sites with Outsource Video Bridging Services						
27		Develop ViIP Security Plan						
28		Secure Necessary Campus Infrastructure for ViIP Transport						
29		Procure and Install Interface Hardware for multiple sites						
30		Install Interface Infrastructure Hardware a multiple sites						
31		Test and Certify End-Point Hardware with Outsource Video Bridging Provider						
32		Provide Site Training							1/12

Fig. 13
Baseline ViIP Migration Implementation

APPENDIX A: SPLIT PRI TEST RESULTS SUMMARY

NISN has conducted utilization tests of two custom PRI circuits configured to support both ISDN and IP traffic (fig. 14). The objective of the test was to evaluate the quality of H.323 Video over IP services utilizing this special configuration. The circuit performance was found to be stable and quite acceptable at video speeds less than 920kbps over IP and up to 384k ISDN. Although the PRI circuits were configured to support 1024kbps of IP and 384kbp of ISDN, reliable IP throughput was found to be limited to 90% of 1024 due to MCI a service policy. Engineering completed the testing on June 24, 2004. No other issues were discovered during the testing.
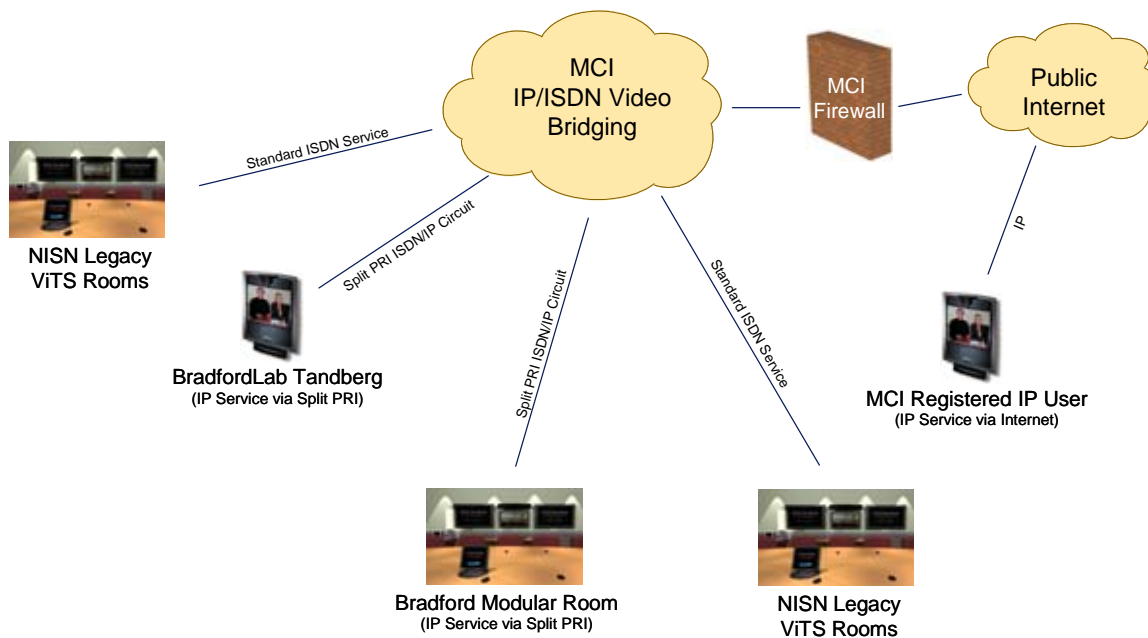

Fig. 14
Test Configuration Supporting Both ISDN and IP Traffic

Migration Plan White Paper

APPENDIX B—MCU PORT UTILIZATION STUDY SUMMARY

NISN has conducted a MCU port utilization study on NISN Standard ViTS by analyzing six months of data taken from the ViTS scheduler database to determine peak port utilization occurring within any 30 minute interval of any 24 hour working day for the last 6 months. Although these results represented conferences that had been scheduled on the ViTS scheduling software and did not represent actual conferences conducted, the results of the data revealed that peak scheduled MCU port utilization reached 73 ports (equivalent to 450 "64kbps" channels as shown in chart) while average port utilization is between 25 and 40 ports (fig. 15). Engineering compared this data to data provided by the outsourced video bridging service and discovered a 15% to 20% delta meaning that some conferences scheduled in the NISN ViTS scheduling system actually never occurred.
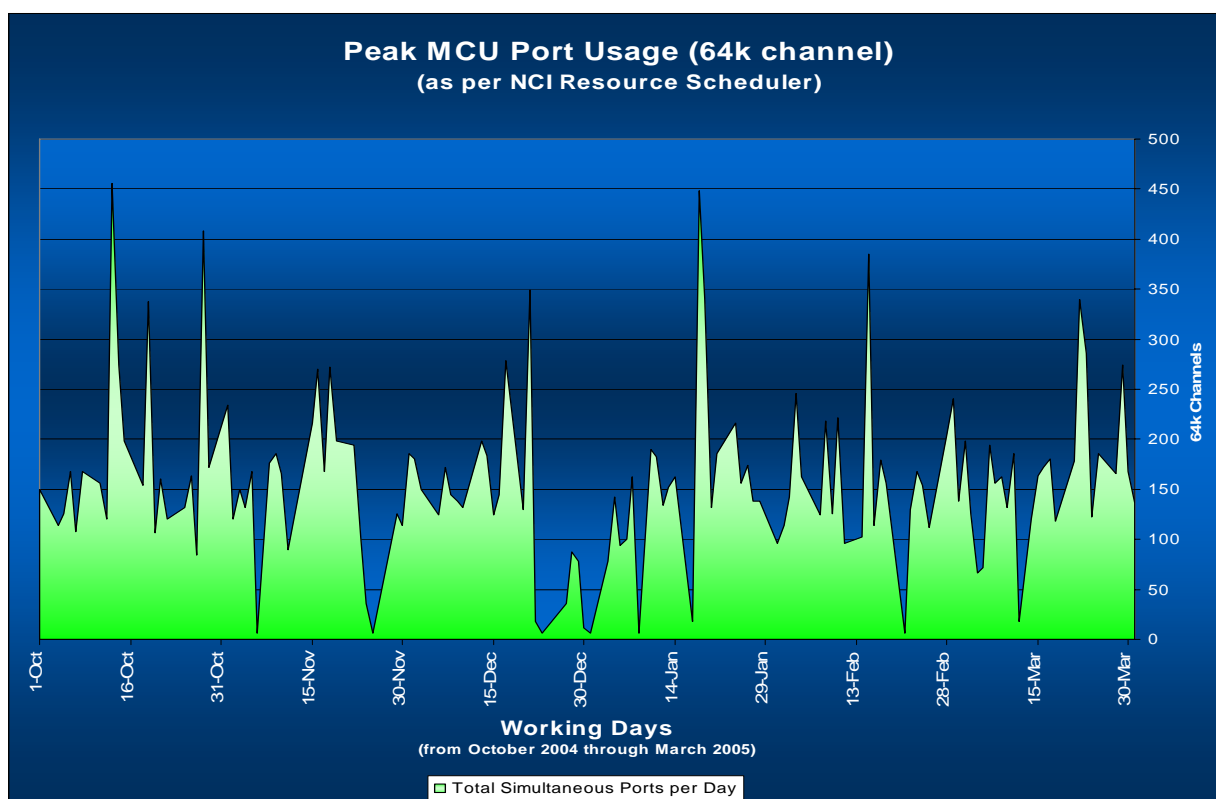

Fig. 15
Peak MCU Port Utilization